DOCUMENT RESUME

ED 308 787 HE 022 756

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TITLE Using Key Indicators To Guide Curriculum Review at a Community College. AIR 1989 Annual Forum Paper.
PUB DATE May 89
NOTE 24p.; Paper presented at the Annual Forum of the Association for Institutional Research (29th, Baltimore, MD, April 30-May 3, 1989).
PUB TYPE Reports - Research/Technical (143) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *College Curriculum; College Programs; *Community Colleges; *Curriculum Development; Evaluation Criteria; *Evaluation Methods; Institutional Research; *Program Evaluation; Two Year Colleges
IDENTIFIERS *AIR Forum

ABSTRACT

Accepted guidelines for academic program review often clash with the needs of administrators, who require timely and frequent information for monitoring the quality of academic programs. A method is described for developing key indicators that permit annual scanning of all programs. The goal was to develop indicators that would flag programs showing unusual variation; these programs are then selected for more thorough, focused evaluation. The process described developed the following model components, with specified program characteristics for each: (1) market demand (student demand, employer/business demand, demand from transfer institutions); (2) resources (students' entry skills, faculty/staff, space, equipment, supplies, operating budget, and college facilities and services); (3) process (applications, enrollments, academic progress and performance, full time/part time faculty ratios, student satisfaction, retention, withdrawals, and changes of major); and (4) outcomes (graduation, placement, employment, transfer rates, achievement of competencies, salaries, "transferability," and satisfaction of students, employers and transfer institutions). Validation of the model is also discussed. Contains 10 references. (Author/KM)

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Using Key Indicators to Guide Curriculum Review at a Community College

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Presented at the Twenty-Ninth Forum of the Association for Institutional Research, Baltimore, Maryland, May 1989

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for Management Research, Policy Analysis, and Planning

This paper was presented at the Twenty-Ninth Annual Forum of the Association for Institutional Research held at the Omni Inner Harbor Hotel and the Lord Baltimore Hotel, Baltimore, Maryland, April 30 - May 3, 1989. This paper was reviewed by the AIR Forum Publications Committee and was judged to be of high quality and of interest to others concerned with the research of higher education. It has therefore been selected to be included in the ERIC Collection of Forum Papers.

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Abstract

Accepted guidelines for academic program review often clash with the needs of administrators, who require timely and frequent information for monitoring the quality of academic programs. This paper describes a method for developing key indicators that permit annual scanning of all programs. The goal was to develop indicators that would flag programs showing unusual variation; these programs are then selected for more thorough, focused evaluation. The intended audience is institutional researchers involved in the academic program review process.

Introduction

An extensive literature exists on models, methods, and principles for conducting academic program reviews (cf. Barak, 1982; Conrad & Wilson, 1985). In practice, however, guidelines for thorough and accurate data collection procedures often clash with the needs of administrators who use the information. For example, a sound program review is comprehensive (examining all facets of a program), uses multiple criteria to assess each program facet, is timely, and presents data in a summary form that is easy for administrators to use (Barak, 1982; Conrad & Wilson, 1985; Mark & Shotland, 1987).

The requirements of comprehensiveness and timeliness are especially difficult to balance. Moreover, the operational definition of "timeliness" is changing. In the past, a full-fledged audit of each program every 5 or 6 years was a common accreditation standard, but the standard is shifting to ongoing, continual evaluation (Middle States Association of Colleges and Schools, 1982). This shift, which reflects the quickening pace of change in our society, has generated a need for supplementary annual scanning of all programs (Barak, 1982).

This paper describes a method for developing a set of key program indicators permitting annual scanning across all academic programs. The goal was to develop indicators that would flag programs showing unusual variation; these programs would be selected for more thorough, focused review.

Limitations of the Existing Review Process

At Delaware County Community College, the existing policy on academic program audits was developed in 1980. The policy requires that each academic program be given a full scale audit at least once every five years. New programs are to be audited within two years of their start-up date. The Office of the Vice-President for Instruction identifies the programs to be audited in a given year. An evaluation team, which is formed for each audit, outlines key questions to be addressed in the audit.

The Research Office is responsible for data collection, data analysis, and reporting. The report prepared by the Research Office is reviewed in turn by the Evaluation Team, the Vice-President of Instruction, the President, and the Board of Trustees. Each of these reviewers makes comments and recommendations before sending the report to the next reviewer. The President recommends to the Board of Trustees action on the program ("continue, revise, or phase out").

The audit report is comprehensive. It includes all program and course competencies and their relationship to one another, staffing patterns, faculty background and experience, students' evaluation of instruction, historical analysis of course scheduling patterns, faculty evaluation of the program, an inventory of facilities, equipment, and support services, student and faculty evaluation of facilities, equipment, and support services, student profiles, enrollment trends, retention rates, students' academic performance and progress, discipline and program costs, regional and local labor market supply and demand,

enrollments and graduates at other local colleges, placement rates and salaries of graduates, and graduates' and employers' assessments of the program.

Conducting an audit requires a major investment of the Research Office's resources, and several serious flaws in the process have become evident. The goal of auditing programs on a five-year cycle, with new programs receiving an audit within two years, has been unattainable, despite efforts to combine "clusters" of related programs into one audit. The problem has been exacerbated by the proliferation of new curricula offered by the college during the past decade. The time required to complete the audit cycle (a minimum of 1 year to prepare the initial report, another year or two to complete the review cycle) often results in a "stale" report. By the time the Board of Trustees reviews the audit report, a program may have undergone substantial change and may bear little resemblance to the curriculum described in the report.

Despite these flaws, the audits have had value; most audits yield several major findings that identify areas of strength and/or weakness. However, the effort expended in conducting the audit is disproportionate to the results it yields. What is needed is a more efficient method of identifying a program's essential strengths and weaknesses.

As the limitations in the audit process were becoming evident, the student demographics at DCCC and the mix of programs and services were changing rapidly. These trends emphasized the need for a method of monitoring all programs, on an annual basis if possible, to help administrators track the changes occurring

within academic programs. An annual monitoring mechanism could be used to identify programs requiring more thorough evaluation. These evaluations of targeted programs would be focused on the areas of concern. This approach would reverse the existing audit procedure, in which every program is subjected to a full scale, comprehensive audit, even though questions about the program might be restricted to selected features of the program.

Method

In 1987 the college was awarded a grant from the Metropolitan Life Foundation to develop a Key Indicators model for curriculum review. The Key Indicators Project was staffed by the Vice-President for Instruction, the Dean of Enrollment Management, Research, and Planning, the Director of Institutional Research, and the Registrar. The project team's first step was to gather information on all program facets that might yield relevant indicators. The team members conducted brainstorming sessions to generate ideas. Meetings were held with the college deans and assistant deans, to identify the features they take into consideration in assessing the quality of the programs they administer. A literature review was conducted, and the other community colleges in the state were surveyed to determine their procedures for evaluating academic programs.

Developing the Model

To manage the large amount of information generated by these efforts, the team developed a model, borrowed from Elkin & Molitor's (1984) guidelines for developing management indicators. The model contains four basic components: market demand,

resources, process, and outcomes. Most ideas generated from the brainstorming session, the meetings with administrators, the statewide survey, and the literature search fit into one of these categories.

The next step was to list, for each model component, existing data sources that might serve as measures of that component of the model. The team agreed that the pilot set of indicators should rely upon data already available or accessible. As the key indicators are tested and refined, new data collection methods would be developed to fill in gaps that appear in the model.

The Key Indicators Project Team compared the "wish list" of measures with the list of currently available data sources; the team identified characteristics of academic programs that met two criteria: 1) characteristics frequently cited by the team and by other administrators as important indicators, and 2) characteristics for which some measure was available. The characteristics most often cited are shown in Table 1. Table 2 shows data sources that currently exist to measure these characteristics.

Total Quality Philosophy: Basis for Defining Indicators

As the areas to be targeted for monitoring began to crystallize, the team started to work on operational definitions of the indicators. The team's approach to the task was influenced by concepts in the Total Quality literature (cf. Deming, 1986; Imai, 1986) and by methods described in the statistical process control literature (e.g., Grant & Leavenworth, 1974; Ishikawa, 1976). A major tenet of this literature is that one must gather data on processes to determine their unique "fingerprint" or

TABLE 1

Program Characteristics Most Commonly Cited as Important Indicators

Model Component	Program Characteristics
Market Demand	Student Demand, Employer/Business Demand, Demand from Transfer Institutions
Resources	Students' Entry Skills Faculty/Staff (Availability, Expertise) Space, Equipment, Supplies, Operating Budget College Facilities and Services
Process	Applications, Enrollments Academic Progress and Performance Full Time/Part Time Faculty Ratios Student Satisfaction Retention, Withdrawals, Changes of Major
Outcomes	Graduation, Placement, Employment, Transfer Rates Achievement of Competencies Salaries "Transferability" Satisfaction of Students, Employers, Transfer Institutions

TABLE 2

Existing Data Sources for Each Model Component

Model Component

I. Market Demand (Student Demand, Employer, Transfer Institution)

1) Number of new students

2) Number of applications

3) Proxy measure: Percent employed in related position (see outcomes component)

4) Proxy measure: Percent continuing education (see outcomes component)

II. Resources (Program, Faculty/Staff, Facilities/Services, Students)

5) Proportion of credit hours (across the fiscal year) in core courses taught by full-time faculty

6) Ratio of: Direct cost of program to program revenue

7) Capital equipment cost for discipline (where discipline-program match exists)

8) Proportion of entering students scoring at the Basic or Developmental level.

III. Academic Performance

9) New students as proportion of total in major

10) Term-to-term retention: all students

11) Term-to-term retention: new students

12) Graduation rates

13) GPA

Table 2 (Continued)

14) Proportion of credits successfully completed*

15) Success rates in gate courses (gate courses identified by assistant deans)

16) Proportion of second-year students

17) Proportion enrolled in courses in own discipline (applies to selected programs)

(--) Indicator to be developed: proportion of core courses successfully completed

IV. Outcomes

18) Placement rates

19) Proportion employed in related field

20) Proportion transferring

21) Median full time salary

22) Graduates' evaluation of program

23) Employers' evaluation of program

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* - This indicator was dropped after initial testing.

pattern of variation. Studying processes in this way enables the researcher to distinguish between normal, random variation in the process (variation due to "common causes") and variation signaling that something has occurred (variation due to "special causes").

The team's goal was to gather trend data for each area targeted for monitoring and then to devise criteria for flagging programs showing unusual variation. Each program's past performance would be used as a baseline to define the "normal" range of variation for that program.

The team's approach adopted some methods commonly used to develop key indicators and rejected others. One common feature of the indicators described in the literature is their reliance on recent trends as a basic data collection measure. For example, many indicators cited in Elkin & Molitor's (1984) description of management indicators and in the Columbus Technical Institute's model of program review (Task Force on Program Review and Evaluation, 1982) use the most recent 3-year trend as baseline data. The Key Indicators team was committed to using trend data, but wished to empirically test different time intervals to determine which worked best for Delaware County Community College.

A common feature that was rejected by the team was the use of a standard that generates inter-program comparisons. The reasons for rejecting this approach are reflected in Deming's (1986) criticisms of "management by objectives" and "management by numbers". The basic flaw lies not with the use of standards per se, but with managers' tendency to apply standards that are irrelevant to the process and to customer needs. Imai (1986) makes a similar point

in his distinction between "results-oriented management" and "process-oriented management".

Managers tend to grasp any available or convenient benchmark and use it as a standard, regardless of its appropriateness to the processes or programs being compared. Whether the focus is enrollments, placement rates, or retention rates, administrators attempting to interpret data will seek a basis for comparison, such as the college-wide rate. But programs may depart significantly from the college-wide rate for reasons unrelated to program quality. Differences among programs often reflect valid differences in program structure and goals.

In the early phases of developing the Key Indicators, the team repeatedly fell into this trap of evaluating programs by comparing their performance to a college-wide or divisional standard. The team freed itself from this trap by borrowing Quality Improvement statistical process control concepts most often used in manufacturing settings (Ford Motor Co., 1983). One principle is that no attempt should be made to improve or change a process until the process has been studied to determine if it is stable. A process is said to be stable (or "in statistical control") if variations in the process are due solely to random variation; in other words, no variation is due to "special causes".

In adapting this philosophy to our Key Indicators model, the team agreed that the purpose of each indicator would be to examine each program with its past performance and to set flags that would indicate that an unusual change ("special cause") had occurred. The flag conveys no direct information about program quality;

change that has occurred may be favorable, unfavorable, or irrelevant. The flag serves solely to point managers to programs that require closer scrutiny. A well-developed set of indicators will also suggest which features of a program should be targeted for closer study.

This approach to program evaluation is a radical departure from the previous approach taken at Delaware County Community College, in which a full scale audit was applied to every program selected for audit. The Key Indicators approach is a preventive one that strives for early warning of potential problems. The previous approach was often a remedial one; by the time a program had been selected for evaluation, it could have developed serious problems.

Developing Indicator Flags

By June, 1988, the basic philosophy of the Key Indicator team's approach had been agreed upon, the model had been clarified, and the team began testing indicators and flagging systems. Table 3 summarizes the approaches tested. To test each approach, the team applied the indicator across all programs to determine which programs would have been flagged if the indicator had been in use in 1987-88. Hindsight gave us the opportunity to assess whether the flagging would have been appropriate.

Method 1 flagged any program showing a continuing trend (over 3, 4, or 5 years) on an indicator. Three-year trends turned out to be a common pattern, too common to be useful; four-year and five-year trends, on the other hand, were too unusual to be useful.

TABLE 3

Methods Tested for Setting Flags on Key Indicators

METHOD	FINDING
1. Flag programs showing a trend (3-, 4-, 5-year) in the absolute value of an indicator.	3-year trends too common; 4-year and 5-year trends too rare
2. Flag programs falling outside limits defined by recent history of program: 3-year moving average plus or minus standard deviation based on 5-year history	Major limitation: no correction for college-wide trends
3. Flag program based on the degree to which it departs from projections, with projections based on either: a) moving average or b) regression line based on program history	(a) and (b) generated similar projections, with (a) yielding slightly better prediction of 1988 data. Method 3(a) chosen as flag for pilot set of indicators.

Method 2 flagged programs falling beyond the limits of the program's historical variation. We tested different moving-average intervals (3, 4, and 5 years) and different definitions of limits. The major drawback to this approach is that it does not correct for a college-wide trend that affects all programs equally.

Method 3 flagged programs with a Key Indicator value that departed significantly from projections based on the program's recent history. Method 3, like Method 2, flagged programs with a changing performance on an indicator. Method 3, however, corrects for generic trends; it flags programs with discrepancy scores that depart from the norm for the current year. Thus, a sudden rise in enrollments that affects many programs in a particular year will not result in all programs being flagged. Only programs showing change departing from the norm are flagged. This approach, of course, does incorporate into the model a college-wide standard. However, the standard is used as a measure of stability, not as an evaluative measure.

After defining the indicator as the discrepancy between the 3-year moving average and the current value of an indicator, the team tackled the task of choosing a flagging system. Once again, the team tested different parameters and evaluated the results using current knowledge about the programs as a validity test. The 1-standard deviation limit was chosen because it flagged programs that, according to hindsight, deserved a closer look.

Table 4 shows the Fall-to-Winter retention Key Indicator (#10 on Table 2). Programs are flagged if their discrepancy score ("Year 4 minus 3-Year Mean") falls outside the limits defined by

TABLE 4

Key Indicator Example: Fall-to-Winter Retention Rates

FALL-TO-WINTER RETENTION RATES BY PROGRAM

PROGRAM	YEAR 1	YEAR 2	YEAR 3	3-YEAR MEAN	YEAR 4	YEAR 4 MINUS 3-YEAR MEAN
PERIOPERATIVE	9	33	21	21	42	21
CLERICAL	49	42	37	43	60	17
BIOMEDICAL EQUIP TECH	75	79	69	74	89	15
RESPIRATORY THERAPY	94	90	84	89	100	11
CHEMICAL TECH	55	71	64	63	71	8
MICROCOMPUTERS	28	21	28	26	32	6
FIRE SCIENCE	66	56	75	66	70	4
ELECTRONICS	66	72	68	69	72	3
TECHNICAL STUDIES	67	41	76	61	64	3
UNIT CLERK	64	40	62	55	58	3
EARLY CHILD ED	72	77	74	74	76	2
GENERAL ED	53	49	48	50	51	1
LEGAL SECRETARY	75	74	61	70	70	0
NATURAL SCIENCE	67	71	67	68	68	0
ADMINISTRATIVE SEC	73	62	67	67	67	0
LIBERAL ARTS	65	59	63	62	62	0
DRAFTING/DESIGN	48	62	72	61	59	-2
COMPUTER SERV TECH	74	74	71	73	71	-2
ENGINEERING	70	66	74	70	68	-2
MEDICAL SECRETARY	80	63	73	72	70	-2
BUSINESS ADMIN	71	67	67	68	66	-2
COMPUTER OPERATIONS	74	66	65	68	66	-2
BUSINESS MANAGEMENT	64	64	68	65	63	-2
SECRETARIAL CERT.	46	47	49	47	45	-2
ADMIN OF JUSTICE	69	72	74	72	68	-4
ACCOUNTING	64	64	60	63	58	-5
COMM/GRAPHIC ART	84	74	65	74	69	-5
NURSING	94	96	88	93	87	-6
RETAIL MANAGEMENT	81	78	72	77	71	-6
HOTEL/REST MANAGEMENT	72	74	70	72	65	-7
MEDICAL ASSISTANT	78	80	77	78	71	-7
CLIMATE CONTROL	73	80	67	73	64	-9
SURGICAL TECH	82	88	87	86	75	-11
ROBOTICS	100	72	68	80	69	-11
COMPUTER SCIENCE	71	75	75	74	62	-12
COMPUTER PROGRAMMING	59	57	55	57	45	-12
CONSTRUCTION TECH	54	63	59	59	45	-14
MECHANICAL TECH	71	45	57	58	41	-17
ENERGY SYSTEMS	56	86	83	75	35	-40
MEAN						-2
STANDARD DEVIATION						10

the mean discrepancy (-2) plus or minus one standard deviation unit (S.D. = 10). Even though a retention report is issued each term, showing historical retention rates for each program, the pattern shown by the "outlier" programs in the table is not evident in that report. The team's assessment of this indicator was that it revealed patterns that do not emerge from our typical analysis of retention rates. It should be noted that the Key Indicators team tested many variations on Method 3 before settling on the method illustrated in Table 4. Method 3 will not necessarily be the optimal approach for other institutions.

Different flags will have different program implications. For example, new programs should set off flags in the early years of operation, as enrollments build. The team found these patterns to be useful as validity tests of the Key Indicator flagging system.

Once the method for flagging programs was chosen for the first indicator tested, the team found that the approach could be generalized to the other characteristics chosen for the pilot set of indicators. Limitations in the availability of data forced the team to use a 2-year average for several program characteristics in the model. However, 3-year trends will be available in the 1989-90 year for all program characteristics.

The Key Indicator Outcome Matrix

As the team completed the transformation of program characteristics into actual indicators, it became apparent that a method of summarizing the results across the entire model was necessary. The plan is to generate a matrix similar to the one shown in Table 5. With experience, this matrix should help us to interpret different patterns or clusters of flags and to understand their

TABLE 5

Key Indicator Summary Matrix

	MODEL COMPONENT																					
	I. MARKET DEMAND				II. REFERENCES				III. ACADEMIC PROGRESS									IV. OUTCOME				
PROGRAM	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Accounting																							
Adm of Justice																							
Etc.																							

A "+" will be entered in a cell when the curriculum was flagged on the high side of the indicator.

A "-" will be entered in a cell when the curriculum was flagged on the low side of the indicator.

implications for program quality. The matrix should also aid in eliminating redundant and obsolete indicators, and in identifying gaps in the model. The model can work only if the indicators are reviewed and modified continually, to keep it efficient and responsive to the needs of those who use it.

Validating the Key Indicators Model

One of the first tests of the model will be to compare and contrast the information yielded by the pilot set of indicators with the results of an audit that has been conducted over the past year on a cluster of four academic programs. To be successful, the Key Indicator model should replicate the major findings of the audit. Preliminary indications are that the Key Indicators model will identify patterns of change, and that these patterns will be more apparent from the Key Indicators model than from the audit report.

As noted above, the model will require continual refinement and modification if it is to keep pace with managers' needs for information. The Key Indicators team has already identified indicators that are missing from the model because the data are not currently available. For example, the college lacks data on transfer institutions' assessments of our graduates' competencies. Also lacking is extensive data on students who leave the college without graduating. In the next round of reviewing the model, we will attempt to generate the data needed to fill these gaps.

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FOOTNOTES

1) This project was funded through the Metropolitan Life Foundation Community College Awards for Institutional self-study.